

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division		NUMBER IH97280
INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure		REVISION Final Rev 0
SUBJECT:	INSTRUMENT OPERATION:	DATE 09-09-04
Protimeter Surveymaster SM® Surface Moisture Meter		PAGE 1 OF 12

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1.0 Purpose/Scope

This procedure provides a standardized method for the calibration and operation of the Protimeter Surveymaster SM® moisture meter. It should be used in conjunction with the SBMS Subject Area *Indoor Air Quality* and the IH *SOP97200*.

The Surveymaster meter provides a method for easy and accurate surveys for relative moisture levels in various building materials. The meter is used to identify and determine the extent of water intrusion or dampness, which may provide a basis for microbial growth or material decay.

The unit has two modes.

- **Measure Mode** uses direct contact with material between two electrodes to determine the level of moisture present.
- **Search Mode** uses Radio Frequency (RF) signals as a rapid non-invasive method to detect wetness beneath the surface of materials.

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The instrument readings are based on percent moisture for wood. In any material other than wood the meter will give readings of % wood-moisture-equivalent (%WME). Levels above 20% for wood generally indicate a potential for rot. Therefore, a reading above 20% in any building material indicates a condition, which must be investigated further.

2.0 Responsibilities

- 2.1 Use of the Surveymaster meter is limited to persons who act under the direction of a competent hazard assessment person and have demonstrated the competency to satisfactorily use the meter, as evidenced by experience and training, to the satisfaction of their supervision or existing qualification criteria set by their organization.
- 2.2 Personnel that perform data collection and hazard assessments with this instrument are responsible to follow all steps in this procedure.
- 2.3 The data collected using this meter must have an appropriate evaluation of the hazard and risk by a cognizant Industrial Hygiene professional.

3.0 Definitions

- 3.1 **%WME**: the moisture level in any building material other than wood expressed as a moisture content of wood.
- 3.2 **Measure Mode**: Using the pins, LED and digital display of moisture content in percent.
- 3.3 **Search Mode**: Using RF detection, LED display of relative moisture content beneath the surface of building materials.
- 3.4 **Light Emitting Diode Codes**
 - **Green LED's**: Air-dry conditions. Decay not possible.
 - **Yellow LED's**: Slightly in excess of normal. Investigate further.
 - **Red LED's**: Excess moisture. Decay inevitable.
- 3.5 **Deep Wall Probes**: two long probes insulated but for their tips for the measurement of moisture deep inside a wall regardless of surface moisture or salts contamination.

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3.6 *Salt Contamination:* salts deposited in the building material by previous water intrusion are hygroscopic and may enhance the ability of the material to draw moisture from the room air in humid settings maintaining high moisture conditions. Under dry conditions, this potential is not measurable by the Surveymaster.

3.7 *Unusual readings:* seemingly absurd readings may be attributable to electrically conductive materials such as aluminum foil vapor barrier or carbon containing materials.

4.0 Prerequisites

4.1 Training prior to using this meter:

- 4.1.1 Demonstration of proper operation of the instrument to the satisfaction of the employee's supervision.
- 4.1.2 Other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).
- 4.1.3 Appropriate qualification for IAQ assessments as determined by the employee's supervision.

4.2 Area Access:

- 4.2.1 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas.
- 4.2.2 Verify with the appropriate Facility Support Representative or Technician if a Work Permit or Radiological Work Permit is needed or is in effect. If so, review and sign the permit.
- 4.2.3 Use appropriate PPE for area or wear hearing protection when levels are unknown.

5.0 Precautions

5.1 Hazard Determination:

- 5.1.1 The operation of this meter does not cause exposure to any chemical, or radiological hazards. The meter design does not cause significant ergonomic concerns in routine use. The meter does not generate Hazardous Waste.
- 5.1.2 The unit utilizes several types of sharp pins, which require careful handling to

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prevent puncture wounds. The pins should remain covered until ready for use and then recovered as quickly as possible.

- 5.1.3 By its very nature, the meter may be used in areas where mold growth may be present. Workers should be aware of the potential for exposure to microbiological contamination (e.g. fungi & bacteria) and take necessary precautions for personal protection and minimize disturbance of building materials to prevent airborne release of spores or other antigens.

5.2 Personal Protective Equipment:

- 5.2.1 In areas, where release of spores or antigens are expected (e.g. visible growth), respiratory protection should be worn. The minimum level of protection should be a NIOSH approved N95 filtering face-piece respirator.
- 5.2.2 Additional PPE: Other appropriate PPE for the area being entered. Check with your ES&H Coordinator or Facility Support representative.

6.0 Procedure

6.1 Equipment: (Pictured in Appendix 9.1)

- Meter Body
- Remote pin attachment
- Batteries (2 AA alkaline)
- Deep wall probes (2)
- Calibrator
- Spare pins



6.2 Calibration of the Surveymaster (picture of meter and description of controls and displays is contained in Appendix 9.1.

- Turning Power On: press either the *Pin* or *RIF* buttons on the front of the meter. The unit will remain on for 30 seconds and then turn itself off.
- Warm-up: A warm-up is not required for this meter.
- Remove the protective cover over the pins.
- Press the two needle electrodes against the two exposed



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wires of the calibrator.

- The reading will be 17-19. If not, return the instrument for repair.

6.3 Measure Mode:

- Remove the cover over the pins.
- Push the pins firmly into wood or other building materials.
- Press the *Pin* button.
- Obtain the surface reading on both the digital display and the LED's.
- For readings in recessed or difficult areas recover the pins and connect the external probes to the socket on the right-hand side of the meter body.
- Repeat readings
- For deep penetration of materials attach the Deep Wall Probes to the socket on the right-hand side of the meter body.
- Read levels for each desired depth up to the maximum penetration distance.



6.4 Search Mode:

- Do not remove the pin cover or attach any auxiliary equipment.
- Press the *RF* button.
- There will be no digital readout in this mode.
- The search mode electrode is located in a bulge on the underside of the instrument.
- Hold the instrument against the wall ensuring the bulge is in full contact with the surface.
- Readings are displayed by the LED's. The wetter the material the higher the reading.
- An audible signal will sound at light no. 6 and increase in pitch and frequency as the moisture reading increases. The start point for the audible signal may be changed using the control situated on the left-hand side of the instrument.
- The RF readings are for wetness beneath the surface. Surface wetness (e.g. Superficial condensation) will not affect the readings.
- This mode may cause interference with sensitive electronic equipment and will show readings where electrically conducive materials are present.



6.5 Interpreting Results: Use the Diagnostic Chart below to interpret measurement results.

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Diagnostic Chart

Measure Mode	Search Mode	Interpretation and Comment
Low Reading	Low Reading	Dry surface, dry below the surface- safe
Low Reading	High Reading	Dry surface, damp below the surface. Investigate further using the deep Wall Probe s in Measure Mode.
High Reading	Low Reading	Damp surface, dry below in surface- probable condensation
High Reading	High Reading	Damp surface, damp below the surface. Trouble. Investigate further using the Deep Wall Probes.

6.6 Documenting readings:

- There is no data logging capability in this instrument. By holding the on button while performing the test the unit will hold the maximum reading until the button is released.
- Use the BNL Direct Reading Sampling Instrument Form to record readings (see the IH web page for the most recent version).
- Perform a post calibration. Record on form.
- Return meter and original sampling form to the SHSD IH Laboratory daily or at the end of each project as agreed to by the IH Laboratory Technician.
- Send a copy of any hazard evaluation report written on the survey to the IH Laboratory and the Facility Support Representative.

7.0 Implementation and Training

Prior to using this meter, the operator of the meter must:

- 7.1 Demonstrate proper operation of this instrument to the satisfaction of the employee's supervision. SHSD employee's must have training documented using Attachment 9.3 *Job Performance Measure*.

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7.2 Other appropriate training for the area to be entered (check with ESH coordinator or FS representative for the facility).

8.0 References

- 8.1 Protimeter Surveymaster SM Instruction Manual.
- 8.2 BNL SBMS Subject Area Indoor Air Quality.

9.0 Attachments

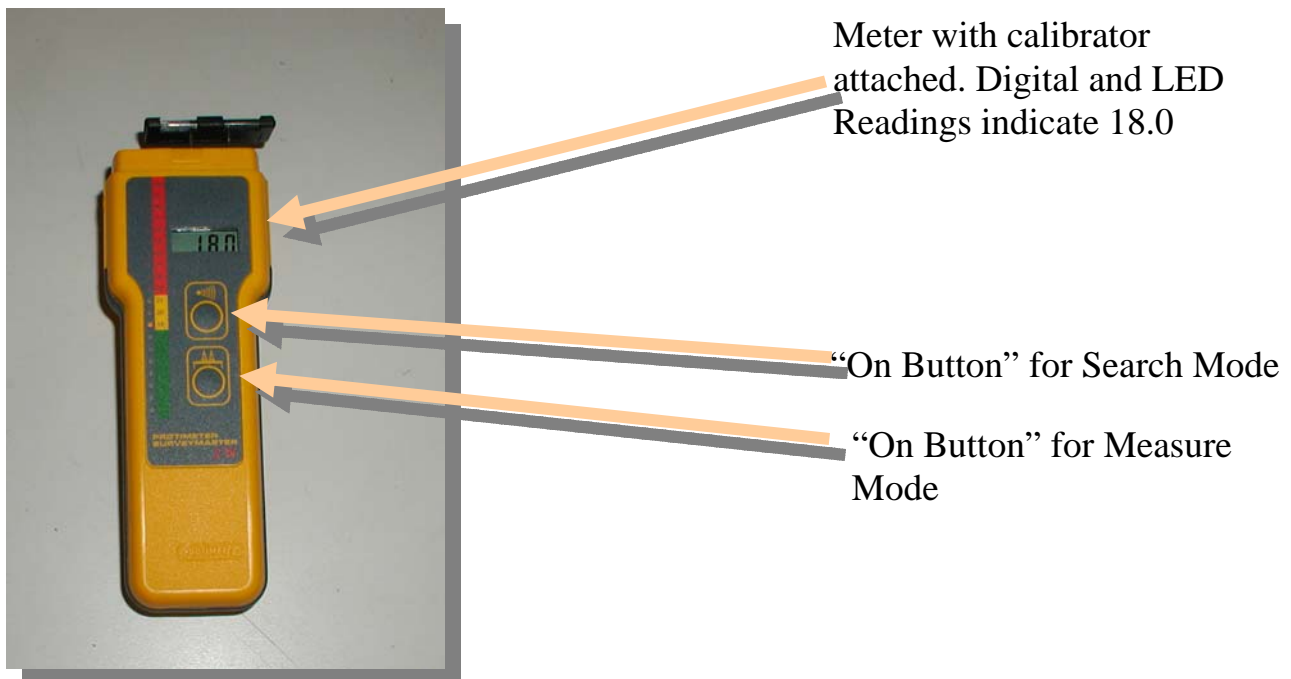
- 9.1 Photo of meter and parts
- 9.2 Theory of Operation
- 9.3 Operation of the Protimeter Surveymaster SM: Job Performance Measure (JPM) Completion Certificate

Document Review Tracking Sheet		
PREPARED BY: <i>(Signature and date on file)</i> J. Peters Author Date 06/25/04	REVIEWED BY: <i>(Signature and date on file)</i> R. Selvey SHSD IH Group Leader Date 09/07/04	APPROVED BY: <i>(Signature and date on file)</i> R. Selvey SHSD IH Group Leader Date 09/09/04
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Attachment 9.1 Photo of the Meter & Calibrator



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Meter body showing
adjustment location for
audible alarm.



Meter body showing remote
pin socket on right-hand side
of meter.

Bottom of meter body
showing RF source bulge.



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Attachment 9.2

Theory of Operation

The Protimeter Surveymaster SM is a moisture meter used to detect moisture in building materials.

The unit may be operated in the Measure or Search mode. The Measure mode uses the pins to determine the moisture content at the depth of penetration whereas the Search mode uses radio frequency (RF) testing to determine moisture content beneath the surface of the material. Search mode provides a rapid, non-invasive assessment of the moisture content below the surface. When high readings are identified by Search Mode, quantitative values may be obtained by using the Deep Wall probes in the Measure Mode.

Readings are presented on both digital and light emitting diode (LED) scales when using any of the pin type electrodes (Measure Mode). This is a relative assessment of moisture content and is based on the premise that a wood product with a 20% moisture content is susceptible to damage by rotting. Only the LED scale is used with RF testing (Search Mode). In materials other than wood, the meter will give readings of % Wood-Moisture-Equivalent (% WME). Therefore, a reading above 20% in any building material indicates a condition, which must be investigated further.

Many types of building materials may be tested with this meter including carpet, ceiling tiles, wallboards, wallpaper, etc. However, all readings are relative and need to be evaluated by an individual experienced in indoor air quality assessments. A number of issues may affect the reliability and interpretation of the readings including:

- calibration of the unit
- electrode placement and material composition
- no reading if placed on either side of an electrical barrier
- high readings if material is electrically conductive (moisture barrier, carbon material, metal)
- effect of salt concentration: does not affect reading but material may become wetter than expected during humid periods by removal of moisture from the air rather than water intrusion.
- depth of wetness

Note: The Search Mode may cause interference with sensitive electronic equipment and will show readings where electrically conductive materials are present.

IH97280 Attachment 9.3 HP-IHP-967280

Environmental, Safety, Health & Quality Directorate
SHSD Industrial Hygiene

Operation of the Protimeter SurveyMaster SM Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:
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Knowledge of the Principles of IAQ Investigations

Criteria	Qualifying Standard	Unsatisfactory	Recovered	Satisfactory
Hazard Analysis	Understands the need to perform a hazard analysis of the sampling area and potential exposure to the sampler.			
Personal Protective Equipment	Understands the need to be aware of the potential IAQ causing agent to sampler and knows how to determine the need for PPE.			
Sampling Protocol	Understands the exposure monitoring logic necessary to appropriately select sampling locations to accurately measure worker, public and environmental exposure potential.			
Analysis of data	Understands the need to perform analysis on the sampling data to assess potential exposure to the sampler, worker, public and environment, and to recommend corrective actions as necessary, and employee notification.			

Practical Skill Evaluation: Demonstration of Meter Operation

Criteria	Qualifying Performance Standard	Unsatisfactory	Recovered	Satisfactory
Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
Survey Mode	Demonstrates the proper way to use the meter in RF measurements of dampness.			
Measurement Mode	Demonstrates the proper way to use the meter in pin conductivity measurements of dampness.			
Record forms	Shows how to correctly and completely fill all forms associated with this SOP.			
Data Analysis	Shows how to correctly have the data analyzed and compared to occupational exposure limits. Knows the correct OELs.			
Employee Notification	Knows how to timely and properly notify workers and management of over exposure. Knows how to inform workers and management of exposure that is within OEL.			

Employee: I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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Evaluator: I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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